Implementation of a Community-Based Weight Loss Program in a North Carolina Healthcare System

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Research Article

Keywords: obesity management, primary care, Community-Based Weight Loss Program, North Carolina

Posted Date: May 3rd, 2021

DOI: https://doi.org/10.21203/rs.3.rs-487233/v1

Abstract

Current strategies for obesity management in primary care leave many patients inadequately treated. We aimed to evaluate a comprehensive primary care clinic-based weight management program's clinical effectiveness in a community practice setting. This is an 18 month long pre-post intervention study. We collected and analyzed anthropometric data on the patients enrolled in the community-based weight loss program. All participants received targeted lifestyle counseling, and 78% received pharmacotherapy. The primary outcomes were percent weight loss post-intervention and proportion of patients who achieved a total body weight loss of 5% or greater. Our program served 550 patients over 1952 visits from March 2019 through October 2020. Patients attended an average of 3.5 visits (SD 2.7). A total of 209 patients received adequate exposure to the program (attended at least four visits) and achieved a mean total body weight loss of 5.7% (SD 5.8%, range − 22.8% − 13.7%). Of these patients, 53.1% lost > 5% of total weight. We demonstrate that a community-based weight management program delivered by obesity medicine-trained, primary care clinicians effectively produces clinically significant weight loss in a community setting. Our approach represents a promising, scalable model for expanding access to obesity treatment for the general population.

Introduction

Obesity continues to be a major public health problem in the United States (US), with 42% of adults meeting the criteria for obesity (BMI > 30 kg/m^2).[1] The proportion of North Carolina adults with obesity also continues to increase, accounting for 32–36% of the population in 2019.[2] The current trends suggest nearly 50% of adults will have obesity and approximately 25% will have severe obesity (BMI > 40 kg/m^2) by 2030.[3] A 2019 report from the Organization for Economic Cooperation and Development (OECD) estimated that 8.4% of the health budgets of OECD countries would go to treat the consequences of obesity over the next 30 years.[4]

Current clinical guidelines highlight the growing evidence for the effectiveness of comprehensive obesity treatment with intensive lifestyle modification, anti-obesity medications, and bariatric surgery.[5] The guidelines also highlight that intense behavioral therapy alone is insufficient to achieve clinically meaningful weight loss long-term for most patients.[6–9] However, wide implementation of these guidelines remains limited.[10] The frequency of weight management counseling has also declined in recent years and remains particularly low among primary care providers.[11–12]

Surveys of primary care healthcare providers reflect inadequate knowledge of the current obesity treatment guidelines.[10, 11, 13] Twenty-five percent of providers would never prescribe anti-obesity medications beyond three months,[11] and 31% would not prescribe pharmacotherapy for obesity under any circumstance.[13] These perceptions and clinical practices persist despite long-term evidence of the safety of anti-obesity medications and obesity itself being a chronic disease.[14–16]

Our university healthcare system's weight management services reflect other major healthcare systems and include bariatric surgery, medical weight management, and behavioral therapy-based programs within a specialty setting. These programs' centralized location with higher costs to patients necessitated the piloting of a scalable, decentralized, community-based weight management program at three primary care clinics. We proposed that the weight management program nested in primary care practices may decrease geographic and financial barriers for patients and increase access to effective, comprehensive obesity care. The objective was to evaluate a weight management program's clinical effectiveness in community-based primary care practices as a scalable model for delivering comprehensive obesity care.

Results

From March 2019 through October 2020, the three pilot weight management clinics served 550 new patients over 1925 visits (Table 1). For 550 patients, the mean age was 49.0 years (SD 13.3, range 18–92). The mean starting weight and BMI were 110.2 kgs (SD 23.5, range 60.3-199.1) and 40.0 kg m^{-2} (SD 7.7, range 25.7–75.6). Patients attended an average of 3.5 visits (SD 2.7, range 1–17) with an average length of participation of 118.4 days (SD 133.3, range 0-566).

Table 1
Baseline Characteristics of All Patients (*N* = 550) and Patients with Four or More Visits (*N* = 209).

Characteristic	Total Patients, *N* = 550*	Four or More Visits, *N* = 209
Age, mean (SD), year	49.0 (13.3)	49.2 (12.8)
BMI, mean (SD), kg/m^2	40.0 (7.7)	40.1 (7.4)
Sex – no. of patients (%)		
Female	464 (84.4%)	179 (85.7%)
Race – no. of patients (%)		
White/Caucasian	343 (62.4%)	132 (63.2%)
Black/African American	164 (29.8%)	61 (29.2%)
Asian	7 (1.3%)	4 (1.9%)
American Indian or Alaska Native	1 (0.2%)	0 (0)
Native Hawaiian Or Other Pacific Islander	1 (0.2%)	0 (0)
Other Race	21 (3.8%)	9 (4.3%)
Unknown	13 (2.3%)	3 (1.4%)
Ethnicity – no. of patients (%)		
Non-Latino or Hispanic	504 (91.6%)	190 (91.0%)
Latino or Hispanic	25 (4.6%)	12 (5.7%)
Unknown	21 (3.8%)	7 (3.4%)
Comorbidities – no. of patients (%)		
Hypertension	264 (48.0%)	99 (47.4%)
Depression	232 (42.2%)	98 (46.9%)
Obstructive sleep apnea	135 (24.5%)	40 (19.1%)
Diabetes mellitus	96 (17.5%)	34 (16.3%)

*Out of 550 new patients, 158 new patients enrolled later in the study, between May 2020 and October 2020, and thus did not have opportunity to complete four visits.

†Commercial includes BCBS, State Health Plan, UMR, and all others (Aetna, Alliance, All Savers, Caremark, Cigna, Golden Rule, Healthscope, MedCost, Tricare, United Healthcare).

‡Uninsured includes Self Pay and UNC Charity Care.

Characteristic	Total Patients, *N* = 550*	Four or More Visits, *N* = 209
Polycystic ovarian syndrome	17 (3.1%)	10 (4.8%)
Non-alcoholic fatty liver disease	35 (6.4%)	13 (6.2%)
NASH	5 (0.9%)	2 (1.0%)
Cirrhosis of liver	2 (0.4%)	1 (0.5%)
Payor Types – no. of patients (%)		
Commercial†	373 (67.8%)	151 (72.2%)
Medicare	88 (16.0%)	30 (14.4%)
Medicaid	60 (10.9%)	14 (6.7%)
Uninsured‡	29 (5.3%)	14 (6.7%)
*Out of 550 new patients, 158 new patients enrolled later in the study, between May 2020 and October 2020, and thus did not have opportunity to complete four visits.		
†Commercial includes BCBS, State Health Plan, UMR, and all others (Aetna, Alliance, All Savers, Caremark, Cigna, Golden Rule, Healthscope, MedCost, Tricare, United Healthcare).		
‡Uninsured includes Self Pay and UNC Charity Care.		

For inclusion in the weight analysis, 209 (38%) patients met the criteria (attended at least four visits). The remaining 341 patients with less than four visits were excluded. Patients with adequate program exposure were remarkably similar to the overall patient population with a mean starting weight and BMI of 110.2 kg (SD 23.3, range 66.5-199.1) and 40.1 kg/m^2 (SD 7.4, range 28.0-75.6), respectively. This population accounted for 67.9% of total encounters (*n* = 1307) with an average attendance of 6.3 visits (SD 2.6, range 4–17) and an average length of program participation of 241.3 days (SD 126.9, range 35–556). Patient's mean weight change was − 6.4 kgs (SD 6.5, range − 33.6–16.6), or -5.7% (SD 5.8%, range − 22.8%-13.7%). The average total body weight loss among patients with diabetes and adequate program exposure was 6.16% (n = 34). Patients with depression (n = 99) lost an average of 5.98% total body weight (Table 1).

Of the 53.1% of patients (*n* = 111) who achieved at least 5% weight reduction, the mean number of visits was 6.8. The completion of approximately 4–5 visits was associated with 5% weight loss (Fig. 2). Approximately 39% of patients lost 7% or more of their total body weight, and 20.6% lost 10% or more (Table 2). For the 46 patients who received TLC alone, 47.8% (n = 22) achieved at least 5% total body weight loss, which is comparable to the TLC plus pharmacotherapy group.

Table 2
Change in Health Measures From Baseline to Follow-up for Patients with Four or More Visits (*N* = 209).

	Total Patients *N* = 209* Mean (SD or 95% CI, range)	**Targeted Lifestyle Counseling (TLC) only** *n* = 46 Mean (SD or 95% CI)	**TLC plus pharmacotherapy** *n* = 163 Mean (SD or 95% CI)
Pre BMI (kg m^{-2})	40.1 (SD 7.4, range 28.0-75.6)	37.8 (SD 5.8, range 28.9–53.0)	40.7 (SD 7.6, range 28.0-75.6)
Post BMI (kg m^{-2})	37.8 (SD 7.3, range 23.3–72.6)	35.8 (SD 5.7, range 26.3–50.2)	38.3 (SD 7.6, range 23.3–72.6)
Change in BMI	2.3 (2.0-2.6, *P* < 0.001)	2.0 (1.4–2.6, *P* < 0.001)	2.4 (2.0-2.8, *P* < 0.001)
Pre weight (kgs)	110.2 (SD 23.3, range 66.5-199.1)	103.2 (SD 18.9, range 73.8-152.7)	112.2 (SD 24.1, range 66.5-199.1)
Post weight (kgs)	103.9 (SD 22.6, range 61.7-193.4)	97.8 (SD 17.8, range 67.3–140.0)	105.6 (SD 23.7, range 61.7-193.4)
Change in weight	6.4 (5.5–7.2, *P* < 0.001)	5.4 (3.9-7.0, *P* < 0.001)	6.6 (5.6–7.7, *P* < 0.001)
≥ 5% weight loss	53.1% (*n* = 111)	47.8% (*n* = 22)	54.6% (*n* = 89)
≥ 7% weight loss	38.8% (*n* = 81)	34.8% (*n* = 16)	40.0% (*n* = 65)
≥ 10% weight loss	20.6% (*n* = 43)	13.0% (*n* = 6)	22.7% (*n* = 37)

*These data excluded the 341 patients who did not complete four visits and were therefore excluded from the analysis. The analysis only considered the number of drugs taken at the end of the study period (as of October 31, 2020).

Patients who attended four or more visits were prescribed a mean of 1.1 medications (SD 0.83; Range 0–4). Approximately half (50.2%) were prescribed one AOM plus TLC; 22.5% (n = 47) were prescribed 2 or more AOM plus TLC, and 22.0% (n = 46) received TLC only (Table 3). Topiramate was prescribed most frequently (36.8%, n = 77), followed by metformin HCl (23.4%, n = 49), semaglutide SQ (16.3%, n = 34), phentermine HCl (16.3%, n = 34), and liraglutide (12.0%, n = 25) (Fig. 3).

Table 3

Number of Anti-Obesity Medications Prescribed for Patients that Attended Four or More Visits (N = 209).

No. of Prescriptions	n	Percent of Total Participants (*N* = 209)
0	46	22.0%
1	105	50.2%
2	47	22.5%
3	9	4.3%
4	2	1.0%

The most common side effects were nausea, abdominal fullness, paresthesia, GERD, elevated blood pressure, brain fog, constipation, diarrhea, elevated lipase level, renal dysfunction. We have had very few major side effects such as kidney stones, pancreatitis, choledocholithiasis. No patient reported cardiovascular events. These side effects resolved with discontinuation of medications.

The program maintained financial stability for the clinics. All three clinicians were able to meet their standard work relative value units (wRVU) goal targets for primary care, which are set at the 55th percentile of a three-year rolling average of Medical Group Management Association (MGMA) median for the specialty. The physician used time-based outpatient Evaluation and Management (E/M) service Current Procedural Terminology (CPT) codes, the RDs used Medical Nutrition Therapy Codes, and the LCSW used behavioral health codes (see Supplementary Table S1). Since all three obesity medicine-trained clinicians were primary care physicians, the financial impact of late cancelations was mitigated by immediately replacing late cancellations with same-day acute primary care visits.

Discussion

The purpose of this project was to explore a new model of community-based care in which obesity medicine-trained primary care physicians provide comprehensive obesity care to better meet the needs of most patients, with specialist care being reserved only for complex cases. To our knowledge, there are few publications describing weight management programs in community-based primary care settings with consistent design and adherence to current obesity treatment guidelines. Specifically, there is a sparsity of effectiveness data using anti-obesity medication in primary care practices serving resource-limited populations.[22]

As evidenced by this project, having a community-based model for a chronic, widely prevalent, clinically important disease like obesity is a valuable addition to any healthcare system, even in the presence of a specialty care model. Through implementation of the model, 53.1% of patients achieved at least 5% total body weight loss after attending four or more visits, losing an average of 5.83% total body weight. Twenty percent of our patients achieved greater than 10% total body weight loss, an average of 11 kgs,

suggesting that durable weight loss is achievable in a primary care setting. The results are promising as the Diabetes Prevention Program and DiRECT study showed that even modest weight loss with nutrition and lifestyle intervention in the community setting has significant health benefits, including diabetes prevention and remission.[9, 23] Long-term follow-up of community-based medical weight-loss interventions to assess for longitudinal health benefits and cost-effectiveness is needed.

The primary benefit of community-based clinics is decreasing the many barriers to evidence-based obesity care. The financial burden was one of the top barriers identified by primary care patients who had visited specialty weight management clinics. Accordingly, patients were only responsible for primary care copays and minimal out-of-pocket costs for prescribed medications. Compared to primarily lifestyle-based studies, our pilot model had fewer visits and fewer copays. Facility fees charged at specialty clinics were also eliminated by providing services in a community-based, primary care setting. Medication cost and insurance coverage limited the use of FDA-approved drugs, both of which are common barriers in community-based care, reflected in the absence of efficacy data on anti-obesity medication in community settings. Despite these limitations, the model replicated weight loss achieved in larger, randomized clinical trials.[24] Physicians strategically prescribed generic medications in combination as alternatives to expensive brand name medications. For example, generic phentermine and topiramate were prescribed as an alternative to Qsymia. Additionally, embedding weight management services within three different central North Carolina communities decreased geographic barriers to care, which was important for reaching the primarily suburban and rural populations of the payor mix.

While more physician-centric than traditional lifestyle-focused programs, this model also provided more personalized patient-centered care and quicker utilization of anti-obesity medications for patients with established obesity. The patient-centered approach paired with adjuvant pharmacotherapy was essential for our patients' success, whose average BMI was 40.0 (Table 1). Among our patients who attended four or more visits, over three-quarters of patients (78%) utilized pharmacotherapy in addition to TLC. Research has shown that in patients with severe obesity (BMI > 40), intensive lifestyle intervention alone usually does not sustain weight loss,[9] and in the absence of a desire to proceed to bariatric surgery, earlier initiation of anti-obesity medication may help.[25]

Lack of training and time have also been documented in the literature as barriers for primary care practitioners to providing evidence-based obesity care.[10–12] Accordingly, this model utilizes a decentralized approach, embedding obesity medicine-trained primary care providers in community settings. Although the model does require additional obesity medicine training for physicians, training can be obtained through continuing medical education pathways resulting in minimal disruption to the practice.

Another significant challenge in providing obesity care in the community setting addressed by the model is financial sustainability. The program remained financially stable using time-based CPT codes allowing all providers to meet their work rVUs goals at the 55th percentile of MGMA median for the specialty. The

multidisciplinary team was comprised through the utilization of existing resources at the primary care clinics, such as RDs and LCSWs, eliminating the need for additional hiring.

Midway through the study period, the COVID-19 pandemic required an immediate transition to virtual care. The clinic successfully transitioned to a virtual model, providing care both in-person and virtually, which further reduced patients' geographic barriers. In our experience, virtual care increased convenience and served to retain patients who may have otherwise been lost to follow up and enhanced continued participation for sustained weight loss. Virtual care will likely further extend the reach and accessibility of obesity care for patients within and outside of our area. The urgency to prioritize equitable access to comprehensive obesity care in our communities continues to be underscored by the consistently higher hospitalization rates and mortality from COVID-19 infection among patients with obesity.[26]

This study has several limitations. First, this was a pilot pre-post interventional study involving a relatively small number of patients with limited follow-up. Among the 550 patients, 158 did not have enough time to complete four visits by October 31, 2020, due to the timing of their initial visit, although some of them may have been seen after that date. These patients (n = 188) were considered lost to follow-up and therefore not included in the final analysis. Future achievement of adequate program participation (four or more visits) by these patients will allow for more robust weight and outcome analyses. Second, certain demographics were not well represented, including males and patients of Hispanic and Latino ethnicity. However, patients of color that are traditionally underrepresented in research studies were well-represented. Third, some anti-obesity medications were not used due to financial constraints and may have limited weight-loss outcomes.

Our next steps include wider implementation of this model with training more primary care providers in obesity medicine within our healthcare system. This training will increase the number of community-based weight management clinics across the state. We will continue to collect data in our Weight Management Registry to analyze secondary outcomes, including changes in comorbidities.

To our knowledge, this is the first study to demonstrate that a community-based weight management program using pharmacotherapy and adhering to current guidelines by primary care clinicians produces clinically significant weight loss. Our approach represents a promising and scalable model for expanding access to comprehensive obesity treatment for the general population.

Methods

Design

This is an 18 month long pre-post intervention study across multiple primary care clinics in a single healthcare network.

Setting

The study took place in three community-based, primary care weight management clinics. The referrals primarily came from 57 primary care clinics within the healthcare system from a wide geographic area. Within those clinics, 253 PCPs serve approximately 230,000 patients, of which approximately 17,000 (7.3%) meet the criteria for severe obesity (BMI > 40). The three primary care physicians involved in the pilot project were board-certified in Obesity Medicine by the American Board of Obesity Medicine (ABOM). Physicians observed an obesity medicine faculty member (S.M.) for one to two sessions and received continued clinical guidance and mentorship.

The clinics' strategic location in suburban areas away from the university hospital and embedded within existing primary care practices reduced patients' geographical barriers to accessing obesity care. Furthermore, compared to specialty copays, smaller primary care copays lowered financial barriers for patients. Standard primary care staffing included registered dieticians (RD) and licensed clinical social workers (LCSW) to aid in chronic condition management within the primary care medical home.

The University of North Carolina Institutional Review Board approved this study. Program evaluation support was provided by a training grant from the UNC Institute for Healthcare Quality Improvement.

Study Population

In March 2019, an obesity registry was created from patients enrolling in primary care Weight Management Clinics. Data were analyzed for patients who met the inclusion criteria of age ≥ 18, BMI > 27 kg/m^2, and adequate exposure to the program (attendance of four or more clinic visits). Four visits were chosen for inclusion because lifestyle-based program evaluations are based on participants completing at least four visits to have had adequate program exposure.[17] Patients who had bariatric surgery within six months of the start of the study period were excluded from the analyses.

The pilot program was conducted between March 1, 2019, and October 31, 2020. Records were retrieved using CDWH 3.0 Carolina Data Warehouse for Health by Web Intelligence. ICD-10 codes identified data for comorbidities (depression, diabetes, hypertension, cirrhosis of liver, sleep apnea, non-alcoholic steatohepatitis, polycystic ovarian syndrome, fatty liver disease). Demographic data (age, race, sex, ethnicity) and the number of visits were obtained from the electronic medical record (Table 1).

Clinical Interventions

The physician and RD evaluated all new patients. An embedded LCSW also saw patients with a history of uncontrolled anxiety, uncontrolled depression, and binge eating disorder as assessed during the physician intake. A standardized template was developed for new patient evaluations and follow-up appointments to fully assess the patient's weight gain history, previous weight-loss attempts, eating behaviors, physical activity, sleep, and stress. The intake included a targeted review of systems and physical exam to assess contraindications to medications and identify secondary causes of obesity (see Supplementary Information).

Medications were reviewed, and weight gain promoting medications were identified and replaced when feasible. During medical evaluations, anti-obesity medication side effects were discussed in detail with patients. Each patient had three monthly visits, followed by two alternate month visits and then visits every three months for the duration of program participation. Some follow-up visits were delayed due to schedule availability.

All patients received targeted lifestyle counseling (TLC) at each visit. The dietary approach promoted the reduction of ultra-processed foods rather than calorie restriction, which has been shown to reduce total caloric intake.[18] This approach also reduced the complexity of dietary counseling, reflected general patient preference, and was used along with patient feedback to develop a nutrition guideline poster to be displayed in clinic exam rooms. Patients took photos of the poster on their personal devices and were instructed to review them regularly. Motivational interviewing techniques were used to develop patient-centered SMART goals. At subsequent visits, goals were reviewed, positive behaviors were reinforced, and strategies were discussed to work on unmet goals. When anti-obesity medications were initiated, preference was given to FDA-approved agents, but prescriptions were adjusted to use combinations of generic medications to reduce cost when possible. Medications used to treat other comorbidities such as diabetes were chosen to enhance weight loss.

Bariatric surgical options were offered if criteria were met (BMI > 40 or BMI > 35 with comorbidities), but most patients initially preferred a medical program. The patients were educated on the potential benefits of bariatric surgery, and the surgical options were re-presented as appropriate throughout the course of care.[19]

All providers use people-first language and motivational interviewing techniques to reduce the stigmatization of obesity. For example, providers refer to a patient as a “patient with obesity” rather than “an obese patient.” The obesity medicine physicians tailored the intervention to each patient’s specific needs by applying the Practice Guidelines for Medical Care of Patients with Obesity[20] recommended by the American Association of Clinical Endocrinologists.

Measures

Demographics were collected on age, gender, race, ethnicity, payor type, and comorbidities. Patients were assessed for weight and BMI at baseline and follow-up. The primary outcome was a weight loss of 5% and percent body weight change at the last visit. Patients with adequate exposure to the program (attended at least four visits) were included in the final analysis.

We obtained standard vital signs and assessed metabolic data at the initial visit, including comprehensive metabolic panel, glycated hemoglobin, thyroid-stimulating hormone, CBC, lipids, and vitamin D (see Supplementary Form S1). For patients who had their first visit virtually, we obtained measurements at their next in-person visit. At all subsequent visits, we measured weight and calculated BMI.

Statistical Analysis

Data were analyzed using Stata/SE software, version 16.1.[21] The analysis included descriptive data on participants' characteristics, demographics, baseline, and follow-up data. The number of new visits, follow-up visits, and referrals was also tracked. The number of patients with four or more visits and weight loss of at least 5% total body weight was calculated to assess primary outcomes. The latest (post) weight and BMI were compared to the baseline (pre) values. Paired t-tests were performed to assess differences in continuous variables. Statistical significance was established at = 0.05.

Declarations

DATA AVAILABILITY

The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Acknowledgments

We thank Darren Dewalt, MD, John Batsis, MD, and Young E. Whang, MD PhD, for review and editing of the manuscript. We also want to thank Sachin Gupta, MD, Shawn Armstrong, and Candice Hunt for help implementing this program.

Author Contributions

SJR and LCF designed the study. SJR, JLM, and TCD were involved in the study implementation. WS and RW developed the registry. SJR, ARL, SEA, SPR, SM analyzed the data. All authors were involved in writing the paper and had final approval of the submitted and published versions.

Competing Interest Statement

Dr. Machineni reports personal fees and others from Novo Nordisk, personal fees from Rhythm Pharmaceuticals, outside the submitted work. Dr. Davis reports personal fees (speaking fees) from Novo Nordisk outside of the submitted work.

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Figures

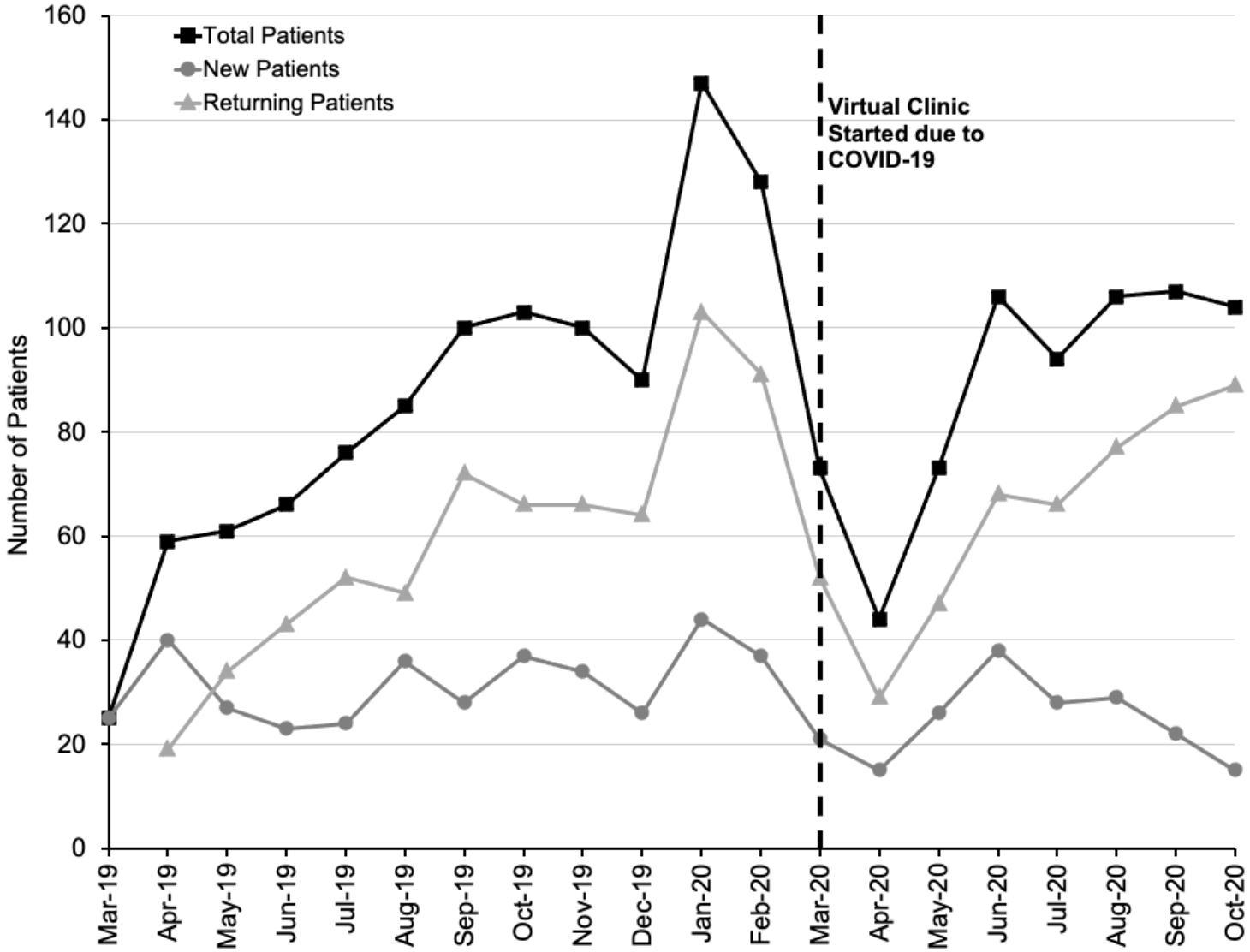

Figure 1

Monthly Weight Management Clinic Utilization from March 1, 2019, through October 31, 2020.

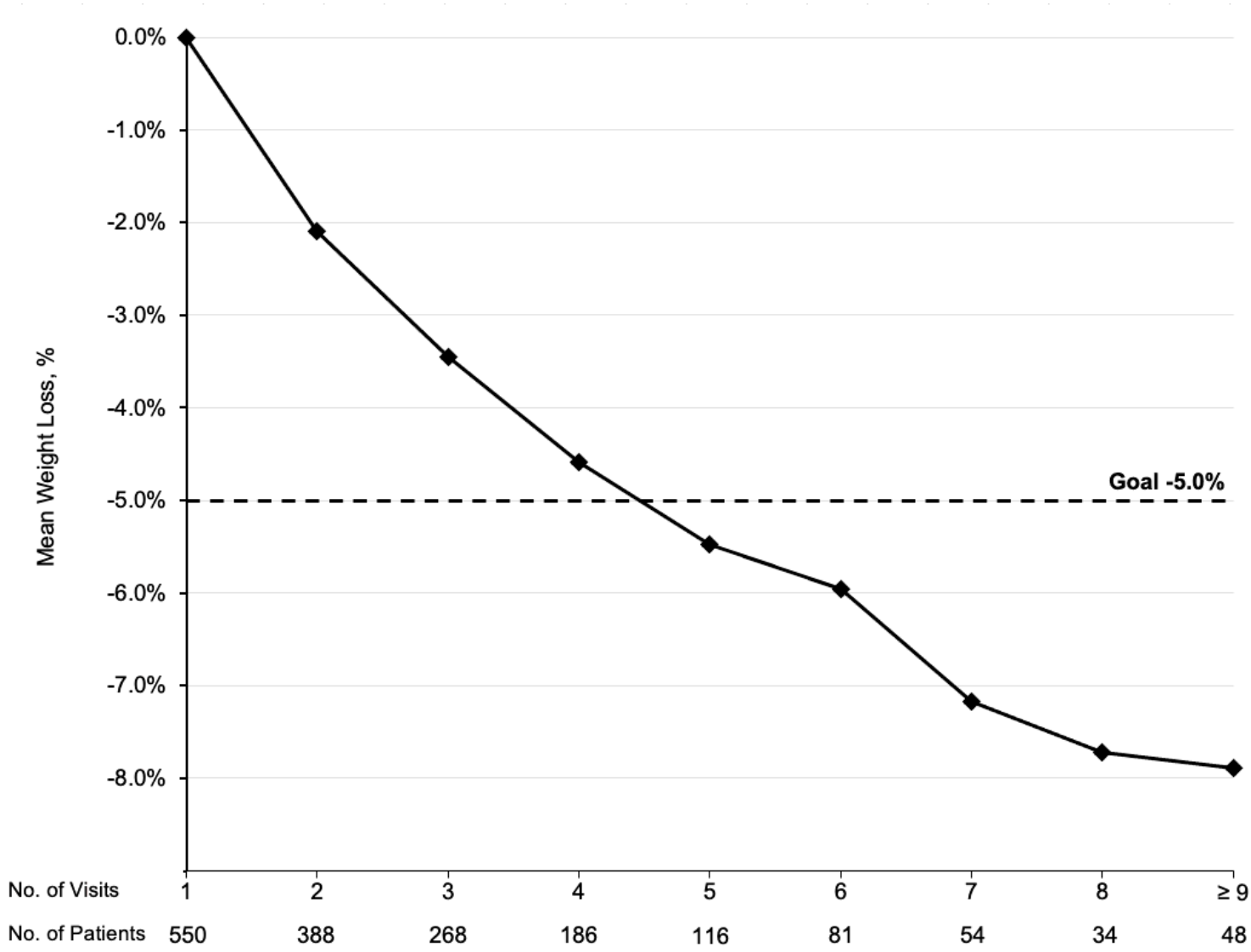

Figure 2

Mean Percent Weight Loss for All Weight Management Clinic Patients by Number of Visits (N = 550).

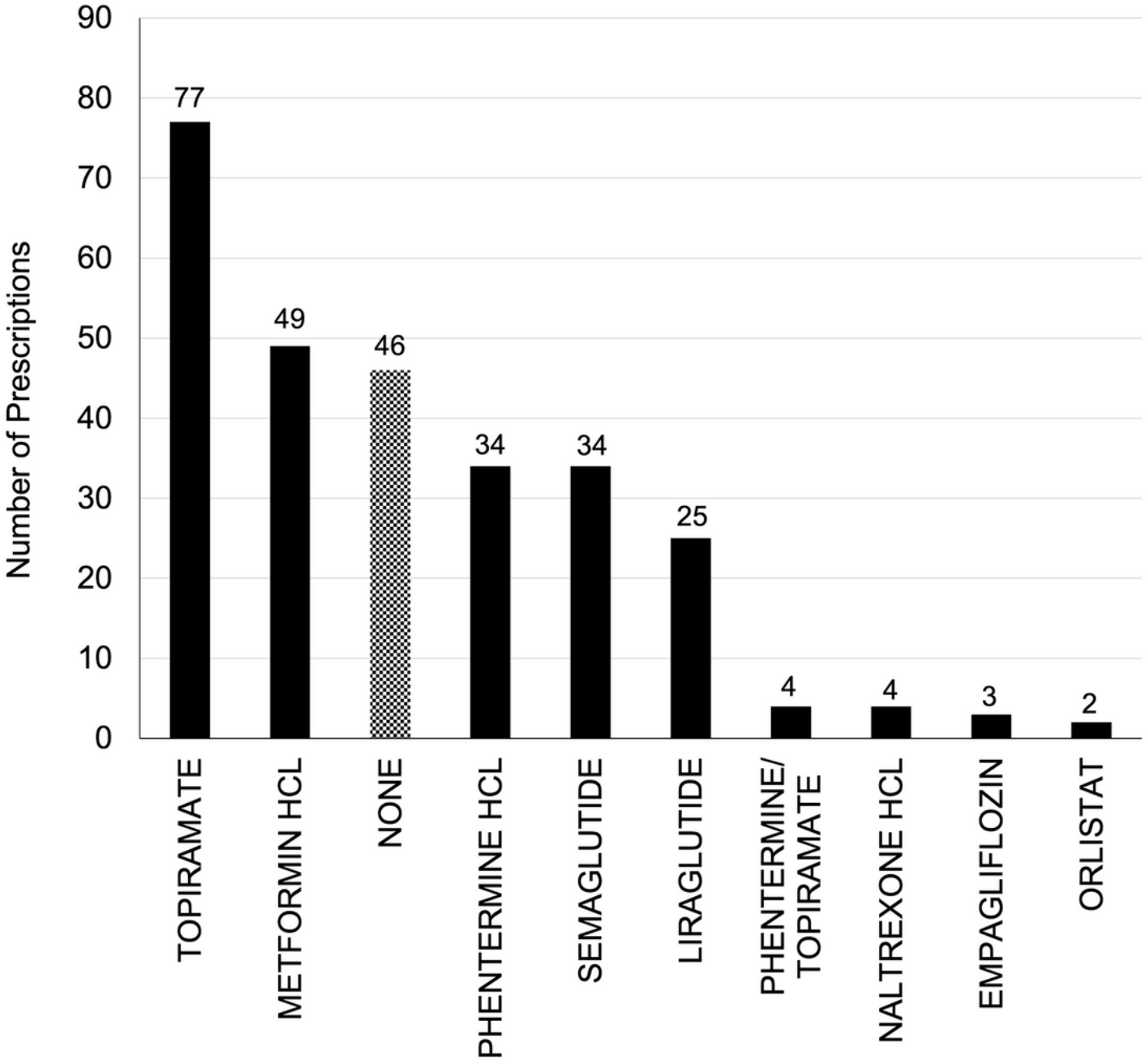

Figure 3

Distribution of Anti-Obesity Medications for Patients with Four or More Visits (N = 209).* *Additional drugs prescribed include: canagliflozin (n = 1), dapagliflozin/metformin HCl (n = 1), and naltrexone HCl/bupropion HCl (n = 1).

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryInformation.pdf